
रैचेट लीवर होइस्ट — विशिष्टि
(पहला पुनरीक्षण)

Ratchet Lever Hoist — Specification
(*First Revision*)

ICS 50.020.10

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FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Cranes Lifting Chains and its Related Equipment Sectional Committee had been approved by the Mechanical Engineering Division Council.

This standard was first published in 1985. In this revision, following major modifications have been done:

- a) New terminology has been introduced;
- b) Lifting capacity has been increased upto 9 tonne; and
- c) Safety requirements like load controlling mechanism, over travel restraint, overload limiting device, overload warning device have been introduced.

The relevant SI units and corresponding conversion factors are given below for guidance:

Pressure 1Pa (Pascal) = 1 N/m²

1 kgf/mm² = 9.806 65 MPa

The composition of the Committee responsible for the formulation of this standard is given in Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

RATCHET LEVER HOIST — SPECIFICATION

(First Revision)

1 SCOPE

This Indian Standard specifies the minimum performance requirements for manually operated lever chain hoists used for the purpose of lifting, lowering, pulling and tensioning applications with safe working load of 0.25, 0.5, 0.8, 1.0, 1.6, 2.5, 3.2, 6.3 and 9.0 tonnes. This standard applies to manually operated lever chain hoists fitted with either link chain or roller chain only.

2 REFERENCES

The standards listed below contain provisions which through reference in this text, constitute provisions of this standard. At the time, of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
2429 (Part 1) : 1987	Specification for round steel short link chains (electric butt welded), grade L(3): Part 1 Non-calibrated load chain for lifting purposes (<i>third revision</i>)
IS/ISO 3076 : 2012	Round steel short link chains for general lifting purposes — Medium tolerance sling chains for chain slings — Grade 8 (<i>first revision</i>)
IS/ISO 3077 : 2001	Short link chain for lifting purposes — Grade T (Type T, DAT and DT), fine tolerance hoist chain
3822 : 2002	Eye hooks for use with chains — Specification (<i>second revision</i>)
6217 : 1982	Specification for short link chain, grade S(6), non-calibrated for lifting purposes (<i>first revision</i>)
6296 : 1983	Specification for short link chain grade S(6) calibrated for pulley blocks and other lifting appliances (<i>first revision</i>)

IS No.

Title

15191 : 2002	Forged steel components for use with grade T(8) chain and chain slings — Specification
15560 : 2005	Point hooks with shank up to 160 tonne — Specification
16772 : 2018	Round steel short link chains for lifting purposes — Fine tolerance hoist chains for hand operated chain hoists — Grade VH
16773 : 2018	Round steel short link chains for lifting purposes — Fine tolerance hoist chains for hand operated chain hoists — Grade TH

3 TERMINOLOGY

For the purpose of this standard following definitions shall apply.

3.1 Ratchet Lever Hoist — A lever operated manual device used to lift, lower or pull a load and to apply or release tension.

3.2 Working Load Limit — The maximum mass, which a ratchet lever hoist can lift in general service.

3.3 Safe Working Load — The maximum mass, which a ratchet lever hoist can lift in a particular stated service. It shall never be greater than the working load limit.

3.4 Rating or Capacity — The safe working load in tonnes specified by the manufacture of the hoist.

3.5 Effort — Average operating effort applied on the lever to raise a load equal to the working load limit together with the effective radius of the handle of the hoist.

3.6 Lift — The maximum distance through which the load hook can travel.

3.7 Head Room — The distance between the saddle of the load hook and the saddle of the suspension hook when the load hook is in its fully retracted position (that is, upper most position).

3.8 Competent Person — The person who is approved and declared as such under the relevant statutory provisions.

3.9 Inspector — The representative of the purchaser.

3.10 Brake — A device for retarding and stopping motion of the load.

3.11 Hook Latch — A mechanical device to bridge the throat opening of a hook.

3.12 Idler Sprocket — A device free to rotate that changes the direction of the load chain. This device is sometimes called idler wheel, idler sheave, pocket wheel or chain wheel.

3.13 Load Block — The assembly of hook or shackle, swivel, bearing, pins, sprocket and frame suspended by the load chain.

3.14 Load Chain — A specially constructed hoist chain that passes through the hoist to support the load.

3.15 Roller Link — A series of alternately assembled roller links and pin links in which pins articulate inside the bushings and rollers are free to turn on the bushings. Pins and bushings are press fit in their respective link plates.

3.16 Ratchet and Pawl — A load controlling mechanism consisting of interlocking pawl(s) and ratchet that act to hold the load by mechanical engagement.

3.17 Load Hook — The hook used to connect the load to the hoist.

3.18 Load Sprocket — A hoist component that transmits motion to the load chain. This component is sometimes called a load wheel, load sheave, pocket wheel, chain wheel, or lift wheel.

3.19 Operating Lever — The lever or handle provided to operate the hoist.

3.20 Reeving — The reeving of the hoists is the path of the load chain between the hoist and load block.

3.21 Suspension Hook — The hook attached to the body of the hoist.

4 PERFORMANCE

4.1 General

4.1.1 All equipment selected in accordance with this standard is designed to perform satisfactorily when used in accordance with 4.4 and used within the safe working load.

4.1.2 All equipment shall provide operating lever pull, lift and headroom in accordance with the manufacturer's

specifications agreed upon by the manufacturer and user.

4.2 Application

4.2.1 Ratchet lever hoists shall be suitable for lifting, lowering, pulling or tensioning loads within their safe working load. They shall be capable of being used in pulling or tensioning applications at any angle, provided the load block, chain and hoist body are not restricted from forming a straight line with the direction of loading.

4.2.2 Because of varying environmental conditions, loading and usage the hoist service life is interrelated to the type and frequency if maintenance performed on the unit. Equipment covered by this standard should be inspected and maintained according to 6.

4.3 Characteristics

4.3.1 Strength

The hoist shall be designed to withstand all stresses imposed under normal operating conditions while handling loads within the safe working load.

Load suspension parts shall be designed so that the static stress calculated for the safe working load shall not exceed 25 percent of the average ultimate material strength. Elements specifically intended to give visible warning of severe overload by permanent deformation shall be designed to show obvious deformation before failure of other load suspension parts.

Working — Ratchet lever hoists shall be constructed to provide the following operating characteristics:

- a) The hoist shall lift, lower or pull a load and apply or release tension in controlled increments when a manual force is applied to the operating lever (handle);
- b) The hoist shall lift or pull the safe working load when one operator exerts a typical lever pull;
- c) The hoist shall be equipped with a mechanism (ratchet and pawl) that shall hold and control loads within the safe working load when the hoist is being operated in either direction;
- d) The hoist shall be equipped with accessible operating controls;
- e) The hoist should have a free-chaining (free-wheeling) capability, which will allow the operator to adjust the load hook position when the unit is not under load; and
- f) The load chain shall be free from twist and tangle at the time of winding or unwinding.

4.4 Performance Characteristics

See Table 1 for generally available lever hoist capacities and typical performance characteristics

Table 1 Typical Characteristics of Ratchet Lever Hoists — Welded Link and Roller Chain
(Clause 4.4)

Sl No.	Safe Working Load (<i>T</i>)	Reeving	Headroom <i>mm</i>	Effort <i>Kg</i>	Lever Length <i>mm</i>
(1)	(2)	(3)	(4)	(5)	(6)
i)	0.25	1	200 – 250	20 – 25	150 – 200
ii)	0.5	1	240 – 290	30 – 35	180 – 250
iii)	0.8	1	270 – 320	20 – 30	240 – 300
iv)	1	1	300 – 350	30 – 40	240 – 300
v)	1.6	1	330 – 380	30 – 40	260 – 410
vi)	2.5	1	375 – 425	30 – 40	260 – 410
vii)	3.2	1	390 – 440	30 – 40	400 – 450
viii)	6.3	2	540 – 590	30 – 40	400 – 450
ix)	9	3	680 – 730	30 – 40	400 – 450

NOTE — This table indicates the range of capacities and characteristics generally available. Those values including a dash (for example, 150-200) denote typical ranges. Consult individual manufacturer's catalog for specific values.

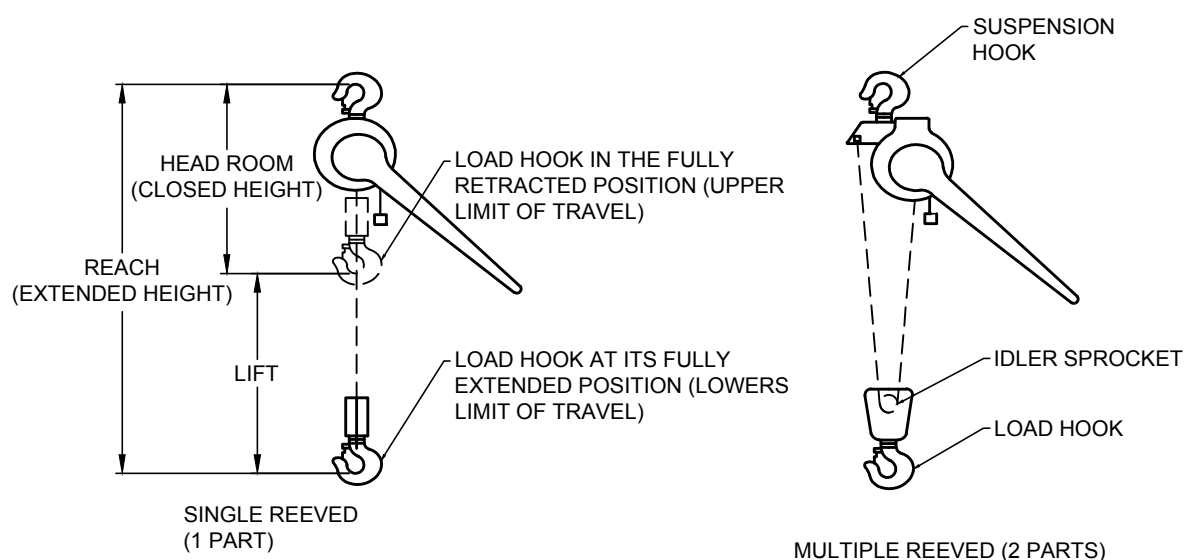


FIG. 1 MANUALLY LEVER OPERATED CHAIN HOIST

5 CONSTRUCTION

5.1 General

The construction in general shall be composed of the body of which the main frame is equipped with gear mechanism, load controlling mechanism, lever, free-wheeling change-over device, idling device, load sheave and the load chain. The upper part of the body and the lower end of the load chain are equipped with a hook. Typical construction of manually lever operated ratchet lever hoist is shown in Fig. 1.

5.2 Load Sprockets

Load sprockets shall have pockets or teeth formed to allow proper engagement of the load chain. They shall be guarded to minimize entrance of foreign objects. Provision shall be made to guard against jamming of the load chain within the hoist mechanism under normal operating conditions.

5.3 Load Chain

Load chain shall be either roller link or welded link type and shall be suitable for hand operated hoist

service (IS/ISO 3076, IS/ISO 3077, IS 2429 (Part 1), IS 6217, IS 6296, IS 15191, IS 16772, IS 16773 or higher equivalent). Chain shall be accurately pitched and sized to pass over sprockets without binding. They shall be proof tested by the chain manufacturer or hoist manufacturer with a load of at least equivalent to 1½ times the hoist safe working load. If a load is supported by more than one part (line) of load chain, the tension on the parts (lines) shall be equalized.

5.4 Hooks

If the hooks are of the swiveling type, they should be free to rotate [see IS 3822, IS 15560 or higher equivalent]. Load blocks should be capable of rotating through 360° when supporting the safe working load. Hooks shall be equipped with latches unless the application makes the use of a latch impractical. When required, a latch shall be provided to bridge the opening of the hook for the purpose of retaining slings, chains, etc., under slack conditions.

5.5 Load Blocks

Load blocks shall be guarded against load chain jamming during normal operating conditions.

5.6 Load Controlling Mechanism

The hoist shall be equipped with a load controlling device of a ratchet and pawl type, which shall perform the following functions under normal operating conditions with safe working load and under test conditions with test loads up to 150 percent of safe working load:

- a) Stop and hold the load when the lever force is removed; and
- b) Provide for incremental movement of the load when lifting or lowering.

The load controlling mechanism shall have heat-dissipating capability for the specified frequency of operation.

5.7 Over Travel Restraint

Before the load chain can be completely run out of the hoist, it shall be restrained in its fully extended position. The restraint shall be such that the unloaded hoist can withstand a lowering operating lever force of twice the force required to lift the safe working load, or such that the hoist with the safe working load can withstand a lowering operating lever force equivalent to the force required to lift the safe working load.

5.8 Overload Limiting Device

5.8.1 An overload limiting device, when furnished, shall be designed to permit operation of the hoist within its safe working load and to limit the amount of overload that can be lifted or pulled by a properly maintained hoist under normal operating conditions.

5.8.2 The overload limiting device may allow the lifting or pulling of an overload, but shall be designed to prevent the lifting or pulling of an overload that could cause damage to the hoist. This does not imply that any overload is to be intentionally applied to the hoist. The overload limiting device is an emergency device and shall not be used to sense the overload imposed by a constrained load.

5.9 Overload Warning Device

5.9.1 An overload warning device, when furnished, shall consist of an element or elements designed to warn the operator of an overload condition that could damage a properly maintained hoist. The presence of an overload warning device does not imply that any overload is to be intentionally applied to the hoist.

5.9.2 The overload warning device is an emergency device and shall not be used to measure the maximum load to be lifted or pulled and shall not be used to sense the overload imposed by a constrained load.

6 LOAD TESTING, MARKING, MANUALS, OPERATING, INSPECTION AND MAINTENANCE PROCEDURE

6.1 Load Testing

All complete new hoists shall be tested by the manufacturer with a test load of at least 125 percent of the safe working load, except hoists incorporating overload devices, in which case the hoists shall be tested with at least safe working load. In addition, all operating functions shall be checked to ensure proper operation.

6.2 Design Test

At the purchaser's option and expense a sample chain lever hoist or hoists shall be selected by the representative of the purchaser and shall be subjected to at least 4 times the working load limit for at least one minute, without breakage of material, partial or complete, or such distortion as could result in the release of the load. Following this test all parts shall be defaced to make them unusable.

6.3 Examination

After the proof loading the hoist shall be thoroughly examined and shall be recorded. It complies with this standard only if it is found free from deformation, cracks, flaws and other defects.

6.4 Marking (by Manufacturer)

6.4.1 Safe Working Load

The safe working load shall be marked on the hoist or load block.

6.4.2 Controls

All control functions shall be identified.

6.4.3 Identification

The hoist shall be marked with the following information:

- a) Name of the manufacturer;
- b) Manufacturer's model or serial number; and
- c) Safe working load.

6.4.4 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act, 2016* and the Rules and Regulations framed thereunder, and the product(s) may be marked with the Standard Mark.

6.5 Warnings

All hoists shall have affixed to the hoist or load block in readable position information concerning operating procedures. The label or labels shall include cautionary language against:

- a) Lifting more than the safe working load;
- b) Operating a hoist with a twisted, kinked, or damaged chain;
- c) Operating a damaged or malfunctioning hoist;
- d) Lifting people or loads over people;
- e) Operating a hoist with other than manual power; and
- f) Removing or obscuring a warning label

6.6 Manual

The manufacturer shall furnish with each hoist one copy of an instruction manual. The manual shall include information on the following:

- a) Operation;
- b) Inspection and testing; and
- c) Lubrication, maintenance and repair.

6.7 Operation

6.7.1 Procedures

Operating procedures recommend in the manufacturer's instruction manual should be followed. In addition to these recommendations, operating practices and load handling procedures, as detailed below, should be followed.

6.7.2 Operating Practices

It is recommended that the following practices be adhered to when using a ratchet lever hoist:

- a) The supporting structure or anchoring means shall have a load rating as least equal to that of the hoist;
- b) The operator shall familiarize himself or herself with the operation of the equipment and its

proper care; If adjustments are necessary or any damage is known or suspected, the hoist shall be removed from service and not used until corrections are made;

- c) Hoists shall be used only in locations that will allow the operator to be free of the load;
- d) The operator shall ensure that he has firm footing and is otherwise secured before operating the hoist;
- e) The operator shall have access to the operating lever;
- f) Before using the hoist, the operator shall be certain that all people in the vicinity are clear of the load;
- g) The operator shall not engage in any activity that will divert his attention while operating the hoist;
- h) The operator shall not attempt to use the free wheeling feature with any load on the hoist. Load shall not be applied with the hoist control in free wheeling mode; and
- j) Hoists shall not be operated by means other than hand power nor operated with an extension on the lever.

6.7.3 Handling the Load

- a) The safe working load shall not be exceeded;
- b) The hoist chain shall not be wrapped around the load;
- c) The load shall be attached to the hook or attached by means of slings or other approved devices;
- d) The load slings or other approved devices shall be seated properly in the saddle of the hook and the hook latch (if used) shall be closed before operating the hoist. Hooks shall not be tip loaded; and
- e) Before lifting or pulling a load, the operator shall be certain that:
 - 1) Chain is not kinked, twisted, or fouled and is properly seated in the pocket;
 - 2) Load is not caught on any obstructions;
 - 3) Multiple chain parts are not twisted and are free to take up load with the load equalized on each supporting strand;
 - 4) Clearance is available to avoid personal injury or property damage;
 - 5) Hoists shall not be operated until the load block, chain and hoist body are directly in line with the direction of loading to avoid side pull;
 - 6) When starting to lift or pull, the load should be moved a few inches, at which time the hoist should be checked for proper load holding action. The operation shall be continued only

after the operator is assured that the hoist is operating properly;

- 7) Do not release the hoist lever while it is under load. Keep control of the lever until the ratchet pawl is engaged and the lever is at rest;
- 8) A hoist shall not be used to lift support or otherwise transport people;
- 9) The operator shall not use the hoist to carry loads over people; and
- 10) The operator should not leave a loaded hoist unattended at the end of a work shift or for extended periods during the work shift. Where operations are such that this condition cannot be avoided, the operator must be assured that the condition does not create a hazard to people or property.

6.8 Inspection and Maintenance Procedures

The inspection and maintenance procedures as covered in the manufacturer's manual should be followed.

Consideration should also be given to pertinent central, state and local regulations in the use of this equipment.

6.8.1 Inspection, Certificate of Test and Examination

6.8.1.1 Inspection

The representative of the purchaser shall have access to the works of the manufacturer at all reasonable times for the purpose of witnessing the specified test and inspecting the testing equipment and methods of examination.

6.8.1.2 Certificate of test and examination

A certificate of test and examination shall be issued with every consignment of hoists, giving the following information for each one:

- a) Safe working load;
- b) Distinguishing mark;
- c) Chain, size and grade; and
- d) Proof load applied.

ANNEX A*(Foreword)***COMMITTEE COMPOSITION**

Cranes Lifting Chains and its Related Equipment Sectional Committee, MED 14

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BEML Ltd, Bengaluru	SHRI RAMESH DESAI (Chairman)
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Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards: Monthly Additions'.

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Amendments Issued Since Publication

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